

REMARKS

Claims 1-11 and 13 and new Claims 14-18 are active in the application.

Reconsideration is respectfully requested.

Applicants' representative wishes to thank Examiner Hailey for the helpful and courteous interview of May 28, 2003. As a result of the discussion it is believed that the issues in the case have been clarified and that the prosecution of the application has been materially advanced.

Claim Amendments

Claims 1-11 and 13 have been amended in order to improve upon the language of the claims and to place the language of the claims in more conventional claim format. No new matter is believed to have been introduced into the claims by the amendments that have been made.

New Claims 14-18 find support in the text in the paragraph bridging pages 11-12; page 12, lines 8-15 and lines 41-43; page 10, lines 17-21 and page 14, lines 45-47. Entry of the new claims is respectfully requested.

Claim Rejection, 35 USC 112

The rejection of Claims 5-7 is believed obviated by the amendment made to Claim 1 which identifies the oxidized starch ethers and esters as anionic starches. As stated on page 4, lines 37-42 of the specification, methods of preparing oxidized starches are well known. The oxidation reactions convert OH and aldehyde groups into carboxylic acid groups. These acid groups are the means of categorizing the oxidized starch ethers and esters as anionic starches. Moreover, the anionic starches may contain other anionic groups.

Claims 11 and 13 have been amended in a fashion which is believed sufficient to obviate the issue raised concerning the phrase "obtainable by the process." Withdrawal of the rejection is respectfully requested.

Invention

The present invention relates to a process for modifying starch by heating the same with a cationic polymer in an aqueous medium.

Although a number of processes are known by which the dry strength of paper stock is improved by treating the paper material with starch modified with a cationic polymer, the methods known are accompanied by undesirable reduction in the drainage rate of the paper stock, which is an effect noted in particular at high starch levels. The present invention now represents an improvement in this technique and is accomplished by treating a paper stock with a modified starch prepared by heating starch with at least one cationic polymer in an aqueous medium to temperatures above the gelatinization temperature of the starch which is selected from the group consisting of the native starches, the oxidized native starches, the starch ethers, the starch esters, the oxidized starch ethers, the oxidized starch esters, the cationic modified starches, the anionic starches and the amphoteric starches and effecting the modification of the starch in the presence of a combination of

(a) a polymeric cationizer selected from the group consisting of polymers containing vinylamine units and having molecular weights M_w of up to 1 million, polyethyleneimines, polydiallyldimethylammonium chlorides, condensates of dimethylamine with epichlorohydrin or dichloroalkanes, condensates of dichloroethane and ammonia, and mixtures; and

(b) a polymeric papermaking drainage aid selected from the group consisting of a water-soluble crosslinked polyamidoamine with or without an ethyleneimine graft, a polymer

containing acrylamide and/or methacrylamide units and having a molecular weight Mw of more than 1 million, a polymer containing vinylamine units and having a molecular weight Mw of more than 1 million, and mixtures thereof.

Prior Art Rejection

Claims 1-4, 8-11 and 13 stand rejected based on 35 USC 102(b) as anticipated by Linhart et al, U. S. Patent 5,851,300. This ground of rejection is respectfully traversed.

Consistent with the discussion of the interview, it is clear that the subject matter of the Linhart et al patent is within the same technical field of the present invention, because it discloses a process by which starch material is cationically modified and that such modified starch is used to treat paper stock in order to impart dry strength to the paper. More specifically, as described in the Summary of the Invention, the process of the patent involves reacting a starch such as corn starch, potato starch, wheat starch or the like with a cationic polymer of the types disclosed in columns 3-7 of the text. The cationic polymers include homo- and copolymers that contain vinylamine units, polymer compound containing polymerized ethyleneimine units which include polyamidoamines that have grafted ethyleneimine units thereon, polymers that contain diallyldimethylammonium chloride as a monomer unit, homo- and copolymers of optionally substituted N-vinylimidazole and the like. The examples of the patent disclose the preparation of two cationic polymer embodiments identified as Polymer 1 and Polymer 2 that are used in many of the examples to treat various types of starch thereby resulting in various cationically charged starches.

The present invention is distinguished from the disclosure of Linhart et al on the basis that, whereas a starch material such as a natural starch is treated with much the same types of cationic polymers disclosed in the patent, nevertheless, the distinguishing feature of the

invention is the co-treatment of a starch with a drainage aid as clearly described in Claim 1.

While the drainage aids are, in fact, cationic polymer materials, note that the polymeric drainage aids are separate and distinct from the polymeric cationizers of the treatment process of the present invention. In this context, Linhart et al contains no disclosure or suggestion of the treatment of a starch material with a combination of two different cationic polymers, whether identified separately by name or function, for any reason whatever. As noted above, the examples of the patent only show the treatment of particular starches with a single cationic polymer material.

That, in fact, the modified starch of the present invention is functionally different from the modified starch product of Linhart et al can be appreciated by reference to the comparative evidence in the specification. Cationizer I, drainage aid I and starch I are identified as starting materials. Inventive example 1 (invention) is prepared by the reaction of starch I with cationizer I and drainage aid I. On the other hand, comparative example 1 is a starch modified by reaction with cationizer I only. Inventive examples 2 and 3 are within the scope of the present invention and describe the results of the treatment of a paper stock with the modified starch of inventive example 1. Comparative examples 2 and 3 are based on the same procedure of Inventive example 2 except that the modified starch that is used is that of comparative example 1. The results obtained show that the treated paper products obtained in inventive examples 2 and 3 possess superior dry bursting strength, CMT values and dry breaking length values than the treated paper products of comparative examples 2 and 3. Accordingly, it is clear that the modified starch of the present invention is functionally superior to a modified starch that is consistent with the teachings of Linhart et al.

Given the distinction of the modified starch of the invention over the modified starch taught by Linhart et al, it is clear that the presently claimed reaction product of Claim 11 and

the method of preparing paper, paperboard and cardboard products of Claim 13 are distinct from the Linhart et al disclosure. It is therefore believed that the anticipatory ground of rejection is obviated and withdrawal of the rejection is respectfully requested.

Claims 1-11 and 13 stand rejected based on 35 USC 102(b) as anticipated by Niessner et al, U. S. Patent 6,160,050. This ground of rejection is respectfully traversed.

The Niessner et al patent is very similar to Linhart et al because it discloses the preparation of a starch modified by treatment with a cationic polymer, which treatment involves the same types of cationic polymers disclosed in Linhart et al. Moreover, just as in Linhart et al, Niessner et al only teaches the treatment of a starch with only one cationic polymer, with absolutely no teaching or suggestion in the patent of the treatment of a starch with two different cationic polymers that function differently in the preparation of a modified starch product. In other words, there is no suggestion in the reference of reacting a starch with a polymeric cationizer and a drainage aid. Accordingly, for the same reasons as discussed above and in view of the relevance of the comparative evidence provided in the present specification, it is believed that Niessner et al likewise fails to anticipate or suggest the invention as claimed and withdrawal of the rejection is respectfully requested.

It is now believed that the application is in proper condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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